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| 10/781,900 | 02/20/2004 | Soko Kado | 248675US-8 CONT | 4216 |
| 22850 | 7590 | 12/02/2005 | EXAMINER | |
| OBLON, SPIVAK, MCCLELLAND, MAIER & NEUSTADT, P.C. 1940 DUKE STREET ALEXANDRIA, VA 22314 | | | LEUNG, WAI LUN | |
| | | | ART UNIT | PAPER NUMBER |
| | | | 2633 | |

DATE MAILED: 12/02/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | | |
|------------------------------|--|------------------------------------|--|
| Office Action Summary | Application No. 10/781,900 | Applicant(s) KADO ET AL. | |
| | Examiner Danny Wai Lun Leung | Art Unit 2633 | |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 July 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-36 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-36 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 February 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date <u>20040721</u> . | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Priority

1. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file. Applicant cannot rely upon the foreign priority papers to overcome this rejection because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

Specification

2. Applicant is reminded of the proper content of an abstract of the disclosure.

A patent abstract is a concise statement of the technical disclosure of the patent and should include that which is new in the art to which the invention pertains. If the patent is of a basic nature, the entire technical disclosure may be new in the art, and the abstract should be directed to the entire disclosure. If the patent is in the nature of an improvement in an old apparatus, process, product, or composition, the abstract should include the technical disclosure of the improvement. In certain patents, particularly those for compounds and compositions, wherein the process for making and/or the use thereof are not obvious, the abstract should set forth a process for making and/or use thereof. If the new technical disclosure involves modifications or alternatives, the abstract should mention by way of example the preferred modification or alternative.

The abstract should not refer to purported merits or speculative applications of the invention and should not compare the invention with the prior art.

Where applicable, the abstract should include the following:

- (1) if a machine or apparatus, its organization and operation;
- (2) if an article, its method of making;
- (3) if a chemical compound, its identity and use;
- (4) if a mixture, its ingredients;
- (5) if a process, the steps.

Extensive mechanical and design details of apparatus should not be given.

3. Applicant is reminded of the proper language and format for an abstract of the disclosure.

The abstract should be in narrative form and generally limited to a single paragraph on a separate sheet within the range of 50 to 150 words. It is important that the abstract not exceed 150 words in length since the space provided for the abstract on the computer tape used by the

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printer is limited. The form and legal phraseology often used in patent claims, such as "means" and "said," should be avoided. The abstract should describe the disclosure sufficiently to assist readers in deciding whether there is a need for consulting the full patent text for details.

The language should be clear and concise and should not repeat information given in the title. It should avoid using phrases which can be implied, such as, "The disclosure concerns," "The disclosure defined by this invention," "The disclosure describes," etc.

4. The abstract of the disclosure is objected to because the abstract contains 174 words.

Correction is required. See MPEP § 608.01(b).

5. The use of the trademark iGM has been noted in this application. It should be capitalized wherever it appears and be accompanied by the generic terminology.

Although the use of trademarks is permissible in patent applications, the proprietary nature of the marks should be respected and every effort made to prevent their use in any manner which might adversely affect their validity as trademarks.

6. The disclosure is objected to because of the following informalities: The acronym "LD" should be clearly explained before its proper use; if "LD" is a trademark, it should be capitalized wherever it appears and be accompanied by the generic terminology.

Appropriate correction is required.

7. Claims 6, 7, 9, 10, 13, 16, 17, 21, 22, 24, 25, 28, 29, 31, and 32 are objected to because of the following informalities: The acronym "LD" should be clearly explained before its proper use; if "LD" is a trademark, it should be capitalized wherever it appears and be accompanied by the generic terminology. Appropriate correction is required.

Claim Rejections - 35 USC § 112

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it

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pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claim 36 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention.

In line 7-9 of claim 36, applicant stated "when bi-directional pumping is performed with lights of backward pumping turned off". Nowhere in the detailed description stated that the lights of backward pumping is being turned off; furthermore, "bi-directional pumping" inherently imply that both forward and backward pumping is being performed, therefore it is unclear to a person of ordinary skilled in the art to enable bi-directional pumping with backward pumping being turned off.

10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claim 36 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

12. Claim 36 recites the limitation "the Raman gain" in line 6. There is insufficient antecedent basis for this limitation in the claim.

13. Claim 36 is rejected as failing to define the invention in the manner required by 35 U.S.C. 112, second paragraph.

The claim is narrative in form and replete with indefinite and functional or operational language. The structure which goes to make up the device must be clearly and positively specified. The structure must be organized and correlated in such a manner as to present a complete operative device. The claim(s) must be in one sentence form only. Note the format of the claims in the patent(s) cited.

In line 6-7 of claim 36, applicant stated “and is approximately the same as a gain...”. It is unclear as to what is being referred to as approximately the same (wavelength characteristic of noise figure? Backward pumping? The Raman gain?).

Claim Rejections - 35 USC § 102

14. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

15. Claims 1, 2, 17, and 32 are rejected under 35 U.S.C. 102(e) as being anticipated by US Patent Number 6,282,002 to Grubb et al.

Regarding to claim 1, Grubb discloses a Raman amplification method for pumping WDM signal light within an optical fiber (40, fig 5), that uses pumping lights having two or more different pumping wavelengths (col 6, ln 6-9), comprising steps of: calculating a combination of optical power at said two or more different pumping wavelengths for said pumping lights in backward pumping (col 6, ln 35-44, where dynamically control the pump energy inherently

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includes calculating) so as to provide a substantially flat Raman gain within a predetermined signal wavelength band (col 6, ln 19-22; col 7, ln 7); carrying out bidirectional pumping with at least part of said pumping lights wherein said bidirectional pumping includes said backward pumping (col 5, ln 19-30); and changing a respective distribution of pumping power to wavelength of said bidirectional pumping (col 6, ln 10-13).

As to claim 2, Grubb further discloses wherein: a total optical power of said bidirectional pumping is not changed from the combination of optical power of said backward pumping calculated in said calculating step (col 6, ln 13-14).

As to claims 17 and 32, Grubb further discloses the method further comprising: performing forward pumping with at least one multi-mode pumping laser having an LD with a grating structure (col 6, ln 45-53).

Claim Rejections - 35 USC § 103

16. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

17. Claims 3-31 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Number 6,282,002 to Grubb et al, as applied to claims 1 and 2 above, in view of European Patent Application Number 1102114 to Emori et al.

Regarding to claims 3 and 18, Grubb discloses the method for pumping in accordance to claims 1 and 2 as discussed above. Grubb does not disclose expressly that the method uses all of said pumping lights for backward pumping and part of said pumping lights for forward pumping.

Emori, from the same field of endeavor, teaches all pumping lights are used for backward pumping and part of said pumping lights are used for forward pumping (col 13, ln 26-47; as shown in fig 7, second pump light is used for forward pumping, while both first pump light and second pump light is used for backward pumping). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to modify Grubb's pump light distribution method such that the method uses all of said pumping lights for backward pumping and part of said pumping lights for forward pumping as taught by Emori. The motivation for doing so would have been to easily control the intensity distribution of the optical signal along the longitudinal direction of the optical fiber (Emori, col 13, ln 45-47).

Regarding to claims 4, 11, 26, and 19, Grubb discloses the method for pumping in accordance to claims 1 and 2 as discussed above; the combination of Grubb and Emori teaches the method for pumping in accordance to claims 3 and 18 as discussed above. Grubb does not disclose expressly that the method require the shorter wavelengths of said pumping lights are used for forward pumping. Emori further teaches wherein: shorter wavelengths of said pumping lights are used for forward pumping (col 14, ln 48-50; wavelength λ_{p1} of the first pump light, which is 1450nm, along with wavelength λ_{p2} of the second pump light, which is 1350nm, are used for backward pumping; while wavelength λ_{p2} of the second pump light, which is 1350nm, the shorter of the two, is also used for forward pumping). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to incorporate Emori's teaching in which the shorter wavelengths of the pumping lights to be used for forward pumping into Grubb's pumping method or the combination of Grubb and Emori's pumping method. The

motivation for doing so would have been to be able to use the forward pump to amplify the backward pump (Stentz, col 3, ln 55-58).

Regarding to claims 5, 8, 12, 15, 20, 23, 27, and 30, Grubb discloses the method for pumping in accordance to claims 1 and 2 as discussed above; the combination of Grubb and Emori teaches the method for pumping in accordance to claims 3, 4, 11, 18, 26, and 29 as discussed above. Grubb does not disclose expressly that the method requires the combination of optical power of backward pumping is larger than that of forward pumping. Emori further discloses wherein: the combination of optical power of backward pumping is larger than that of forward pumping (col 14, ln 33-39; forward pumping energy is 300mW, while backward pumping is 300mW + 25mW). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to incorporate Emori's teaching in which the combination of optical power of backward pumping is larger than that of forward pumping into Grubb's pumping method or the combination of Grubb and Emori's pumping method. The motivation for doing so would have been to further improve noise property (Emori, col 14, ln 17-18).

Regarding to claims 6, 7, 9, 10, 13, 16, 21, 22, 24, 25, 28, 29, 31, Grubb further discloses the method further comprising: performing forward pumping with at least one multi-mode pumping laser having an LD with a grating structure (col 6, ln 45-53).

18. Claims 11, 14, 26, 29, 33 and 34 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Number 6,282,002 to Grubb et al, as applied to claims 1, 2, 17, and 32 above, in view of US Patent Number 6,163,636 to Stentz et al.

Regarding to claims 26 and 11, Grubb discloses the method for pumping in accordance to claim 1 and 2 as discussed above. Grubb does not disclose expressly that the method uses shorter wavelengths for forward pumping. Stentz, from the same field of endeavor, teaches a pumping method of using shorter wavelengths of said pumping lights are used for forward pumping (col 5, ln 20-32; where the shorter wavelength 1345nm is used for 2nd order pump, which is co-propagating, or forward pumping). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to incorporate the method of using shorter wavelength for forward pumping as taught by Stentz, onto Grubb's method of pumping. The motivation for doing so would have been to be able to use the forward pump to amplify the backward pump (Stentz, col 3, ln 55-58).

As to claims 14 and 29, Grubb further discloses the same limitation as discussed above regarding 17 and 32.

Regarding to claim 33 and 34, Grubb discloses an optical transmission system that transmits a WDM optical signal (output of multiplexer 26, fig 2) through an optical transmission path (30, fig 2) comprising: an optical transmitter (16, fig 2) configured to output said WDM optical signal into said optical transmission path; two or more Raman amplifiers that are connected to said optical transmission path in series (32, fig 2), and configured to Raman-amplify said WDM optical signal (col 5, ln 1-10); and an optical receiver (18, fig 2) configured to receive said WDM optical signal propagated through said optical transmission path. Grubb does not disclose expressly wherein: at least one of said two or more Raman amplifiers is configured to adjust a wavelength characteristic of noise figure to provide a predetermined wavelength characteristic of noise figure for receiving said WDM optical signal at said optical

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receiver. Stentz, from the same field of endeavor, teaches wherein: at least one of said two or more Raman amplifiers is configured to adjust a wavelength characteristic of noise figure to provide a predetermined wavelength characteristic of noise figure for receiving an optical signal at an optical receiver (col 4, ln 24-27). As to claim 34, Stentz further discloses wherein one of said Raman amplifiers is configured to adjust a wavelength characteristic of noise figure (“selecting the center wavelength”, col 4, ln 45-54) by way of bidirectional pumping (col 4, ln 55-63; where first order pump 20A, fig 7, is in the counter-propagating direction, or backward pumping; while second order pump 20B, fig 7, is in the co-propagating direction, or forward pumping). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to use Stentz’s bi-directional Raman pump on Grubb’s optical transmission system such that the noise figure in Grubb’s system can be adjusted by using Stentz bi-directional Raman pumps, and be received by Grubb’s receiver. The motivation for doing so would have been to achieve significant Raman gain throughout the transmission span in Grubb’s WDM optical transmission system, thereby minimizing power excursion of the signals, and reduce system impairments due to optical nonlinearities (Stentz, col 5, ln 1-10).

19. Claims 35 and 36 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent Number 6,282,002 to Grubb et al, in view of US Patent Number 6,163,636 to Stentz et al., as applied to claims 33 and 34 above, and further in view of European Patent Application Number 1102114 to Emori et al.

Regarding to claim 35, the combination of Grubb and Stentz discloses the optical transmission system as discussed above regarding claim 34. It does not disclose expressly where

in: all pumping lights in said Raman amplifier are used for backward pumping and shorter wavelengths of the pumping lights are used for forward pumping. Emori, from the same field of endeavor, teaches an optical transmission system where in: all pumping lights in said Raman amplifier are used for backward pumping (col 13, ln 26-47; as shown in fig 7, second pump light is used for forward pumping, while both first pump light and second pump light is used for backward pumping) and shorter wavelengths of the pumping lights are used for forward pumping (col 14, ln 48-50; wavelength λ_{p1} of the first pump light, which is 1450nm, along with wavelength λ_{p2} of the second pump light, which is 1350nm, are used for backward pumping; while wavelength λ_{p2} of the second pump light, which is 1350nm, the shorter of the two, is also used for forward pumping). Therefore, it would have been obvious for a person of ordinary skill in the art at the time of invention to modify the combination of Grubb and Stentz's pump light distribution system such that the system uses all of said pumping lights for backward pumping and shorter wavelengths of the pumping lights for forward pumping as taught by Emori. The motivation for doing so would have been to easily control the intensity distribution of the optical signal along the longitudinal direction of the optical fiber (Emori, col 13, ln 45-47).

Regarding to claim 36, Stentz further discloses wherein the wavelength characteristic of noise figure at said shorter wavelength is substantially due to the backward pumping (col 5, ln 1-2, in which only little noise from the second-order pump, the forward pump, is transferred to the signal; which implies that most of the noise are due to the backward pump), and only backward pumping provides a same wavelength characteristic as that for the Raman gain (fig 4B shows that the noise figure due to only backward pump (a) has a same wavelength characteristic as the bi-directional gain (b)).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Danny Wai Lun Leung whose telephone number is (571) 272-5504. The examiner can normally be reached on 9am-6:30pm Mon-Thurs, except federal holidays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on (571) 272-3022. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

DWL
November 23, 2005


M. R. SEDIGHIAN
PRIMARY EXAMINER